I claim:

1. A multi-stage process for interpreting interferometric fluctuations of frequency-scanning interferometers comprising the steps of:

producing a succession of N interference patterns between object and reference beams at N different beam frequencies within a range of beam frequencies;

recording interferometric data for a corresponding area appearing in each of the N interference patterns, the interferometric data for the corresponding area cycling through conditions of constructive and destructive interference with variation in the beam frequencies;

performing a first approximation of an interference frequency corresponding to a number of interference cycles the interferometric data for the corresponding area undergoes throughout the range of beam frequencies;

determining bounds of the first approximation;

performing a second approximation of the interference frequency within the bounds of the first approximation of the interference frequency; and

converting the second or higher approximation of the interference frequency into a measure corresponding to a path length difference between portions of the object and reference beams that interfere within the corresponding area of the interference patterns.

2. The method of claim 1 in which the first approximation approximates the interference frequency from among the number N or less choices of interference frequency.

3. The method of claim 2 in which the first approximation approximates the interference frequency from among approximately N/2 choices of interference frequency.

4. The method of claim 1 in which the choices of interference frequency within the first approximation are distinguished by whole cycles of constructive and destructive interference within the range of beam frequencies, and the choices of interference frequency within the second approximation are distinguished by less than whole cycles of constructive and destructive interference within the range of beam frequencies.

5. The method of claim 1 in which the first approximation approximates the interference frequency from among a first range of interference frequencies separated by a first increment, the second approximation approximates the interference frequency from among a second range of interference frequencies separated by a second increment, and the second range of frequencies being approximately equal to the first increment separating interference frequencies within the first range.

6. The method of claim 1 in which the first approximation approximates the interference frequency from among M_1 choices of interference frequency and the second approximation approximates the interference frequency from among M_2 choices of interference frequency, and the second approximation being substantially equivalent in accuracy to single approximation that approximates the interference frequency from among the product of M_1 times M_2 choices of interference frequency.

7. The method of claim 1 in which for at least one of the first and second approximations, the number N of beam frequencies is substantially equal to a number M of interference frequency choices.

8. The method of claim 1 in which the range of beam frequencies determines a lower bound of effectively measurable path length differences between the object and reference beams, and an average increment between adjacent beam frequencies determines a range of unambiguous path length differences.

9. The method of claim 8 in which a lower bound of path length differences between object and reference beams within the unambiguous range is associated with an interference frequency of unity or less cycles of constructive and destructive interference within the range of beam frequencies.

10. The method of claim 9 in which an upper bound of path length differences within the unambiguous range is associated with an interference frequency of N/2 cycles of constructive and destructive interference within the range of beam frequencies.

11. The method of claim 1 in which (a) the step of recording interferometric data includes recording intensity data for a plurality of corresponding areas appearing in each of the N interference patterns, the intensity data for each of the corresponding areas cycling through conditions of constructive and destructive interference with the variation in the beam frequencies, (b) the step of performing the first approximation includes performing first approximations of interference frequencies corresponding to the number of interference cycles the intensity data for the corresponding areas undergo throughout the range of beam frequencies, and (c) the step of determining bounds includes determining bounds of the first approximations, and (d) the step of performing the second approximation includes performing second approximations of the interference frequencies within the individual bounds of the first approximations of the interference frequency.

12. The method of claim 11 in which the step of converting the second or higher approximation includes converting the second or a higher approximations of the interference frequencies into measures corresponding to a path length difference between different portions of the object and reference beams that interfere within the corresponding areas of the interference patterns.

13. The method of claim 1 including an additional step of performing a third approximation of the interference frequency within the bounds of the second approximation of the interference frequency, and the step of converting the second or higher approximation includes converting the third or a higher approximation of the interference frequency into a measure corresponding to a path length difference between portions of the object and reference beams that interfere within the corresponding area of the interference patterns.

14. The method of claim 1 in which the step of performing the second or a higher approximation of the interference frequency includes steps of identifying two close approximations of the interference frequency and interpolating a closer approximation of the interference frequency from the two close approximations of the interference frequency.

15. The method of claim 14 in which the step of interpolating a closer approximation includes identifying the closer approximation at a location where a first derivative of an implied function has a zero value.

16. The method of claim 1 including additional steps of calculating a mean intensity of the interferometric data for the corresponding area appearing in each of the N interference patterns, and subtracting the calculated mean from the interferometric data prior to performing the first approximation.

17. A system for deriving length information from interferometric data collected over a range of different frequencies comprising:

a frequency-scanning interferometer for producing a series of interference patterns between object and reference beams over the range of different frequencies;

a common location within the interference patterns that discretely cycles over the range of different frequencies through conditions of constructive and destructive interference at a rate corresponding to an interference frequency;

a data acquisition system for acquiring data samples from the common location within the series of interference patterns;

a processor arranged for (a) evaluating a first set of samples of the interference frequency against the data samples to obtain a first approximation of the interference frequency that matches the cycle rate of the data samples and (b) evaluating a second set of samples of the interference frequency in the vicinity of the first approximation of the interference frequency against the data samples to better approximate the interference frequency that matches the cycle rate of the data samples; and

the processor also being arranged for relating the better approximated interference frequency to length differences between the object and reference beams.

18. The system of claim 17 in which the first set of samples of the interference frequency are frequency components of a Fourier transform that are compared to determine a peak interference frequency component.

19. The system of claim 18 in which the frequency components of the first set of interference frequency samples are spaced apart at a first increment, and the frequency components of the second set of interference frequency samples are spaced apart at a second increment that is finer than the first increment.

20. The system of claim 19 in which a range of the frequency components of the second set of interference frequency samples is approximately equal to the first increment at which the first set of interference frequency samples are spaced apart.

21. The system of claim 19 in which the first increment is no larger than a unit interference frequency.

22. The system of claim 21 in which the first increment is equal to one-half of a unit interference frequency.

23. The system of claim 19 in which the processor correlates at least one of the sets of the interference frequency samples with the data samples by a Fourier transform that identifies the interference frequency sample of the set that best matches the cycle rate of the data samples.

24. The system of claim 23 in which the processor correlates both sets of the interference frequency samples with the data samples by a Fourier transform that identifies the interference frequency sample of each set that best matches the cycle rate of the data samples.

25. The system of claim 17 in which (a) the common location is one of a plurality of common locations in the interference patterns, (b) the data acquisition system acquires individual groups of data samples from the plurality of common locations within the series of interference patterns, and (c) the processor is arranged for (a) separately evaluating the first set of samples of the interference frequency against the individual groups of data samples to obtain first approximations of the interference frequencies that match the cycle rates of the individual groups of data samples and (b) separately evaluating second sets of samples of the interference frequency in the vicinity of the first approximations of the interference frequency against the individual groups of data samples to better approximate the interference frequencies that match the cycle rates of the individual groups of data samples.

26. The system of claim 25 in which the same first set of samples of the interference frequency is evaluated against the groups of data samples and different second sets of samples of the interference frequency are evaluated against the groups of data samples in accordance with differences between the first approximations of the interference frequency associated with the different groups of data samples.

27. The system of claim 25 in which the processor is also arranged for relating the better approximated interference frequencies to range information between the object and reference beams for deriving topographical information about a test surface.

28. The system of claim 17 in which the processor is arranged for evaluating a third set of samples of the interference frequency in the vicinity of the second approximation of the interference frequency against the data samples to even better approximate the interference frequency that matches the cycle rate of the data samples.

29. A method of reducing calculations of a frequency transform for converting interferometric data into length differences between object and reference beams comprising steps of:

acquiring the interferometric data from a plurality of interference patterns produced by the object and reference beams and distinguished by frequencies of the beams;

extracting a succession of N interference data points from corresponding portions of the interference patterns, the succession of data points cycling between conditions of constructive and destructive interference at an interference frequency related to the path length differences between the test and reference beams;

constructing a Fourier transform of the type used for evaluating frequency contributions of M Fourier samples distributed throughout Fourier frequency space to the N data points collected from the interference patterns;

limiting the Fourier transform to the evaluation of less than M Fourier frequency samples similarly distributed throughout a limited portion of the Fourier frequency space; and

identifying from among the less than M Fourier frequency samples an approximation of the interference frequency as a measure of the path length difference between the test and reference beams.

30. The method of claim 29 in which the step of limiting the Fourier transform includes limiting the Fourier transform to the evaluation of no more than M/2 Fourier frequency samples similarly distributed throughout the no more than one-half of the Fourier frequency space.

31. The method of claim 30 in which the step of identifying includes identifying the approximation of the interference frequency from among the no more than M/2 Fourier frequency samples.

32. The method of claim 29 in which the step of identifying includes identifying a first approximation of the interference frequency from among the Fourier frequency samples limited to no more than N Fourier frequency samples.

33. The method of claim 32 in which the step of identifying includes identifying a second approximation of the interference frequency from among new Fourier samples that further divide the Fourier frequency space in the vicinity of the first approximation of the interference frequency.

34. The method of claim 33 in which the Fourier frequency space considered for the second approximation is approximately equal to the Fourier frequency space between the Fourier frequency samples of the first approximation.

35. The method of claim 29 including additional steps of recording intensity information for each of the N interference data points, calculating a mean intensity of the data points, and subtracting the calculated mean from the data points.